Recent Archaeological Research in the Loyalty Islands of New Caledonia

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THE PREHISTORIC CULTURE HISTORY of the Loyalty Islands (Fig. 1), located east of Grande Terre (the main island) of New Caledonia, is one of the lesser known among those of the New Caledonian archipelago of southern Melanesia. Indeed, few modern archaeological research programs had been conducted there before 1990. Oral traditions preserve stories about the islands' settlement by different human groups, the subsequent creation of chiefdoms, and the land divisions or places linked to major events (e.g., Dubois 1976; Guiart 1963, 1992; Illouz 1985). Although these stories often have a chronological frame and are intended to justify present-day social positions, they do not allow us to completely reconstruct past history, as has been done elsewhere in the Pacific (e.g., Kirch and Yen 1982). Since 1992, the Loyalty Islands Province, now responsible for its archaeological heritage, has initiated a program of archaeological surveys and excavations, including the first general study of the characteristics of prehistoric occupations. This program, also financed by the French state, has been conducted by the local Department of Archaeology.

This paper presents some of the results obtained during these first surveys, especially the results of the first salvage excavations conducted between 1993 and 1995 on the three major islands. One of the characteristics of the studies undertaken by the Department of Archaeology has been to focus on the rockshelters discovered during the surveys in order to identify the remains of early prehistoric occupations at these sites, which have been less disturbed than cultivatable areas or sand dunes. This marks the first attempt to study rockshelters in the Loyalty Islands. The first part of this paper presents details about some of these sites and the discoveries made. The analysis of the materials obtained provides the basis for a first synopsis of the prehistoric chronology of the Loyalty Islands.

BACKGROUND

The Loyalty Islands archipelago consists of the three major islands of Ouvéa (132 km^2), Lifou (1196 km^2), and Maré (642 km^2), surrounded by a number of smaller islands of various sizes. Constructed on a basaltic platform, the islands are

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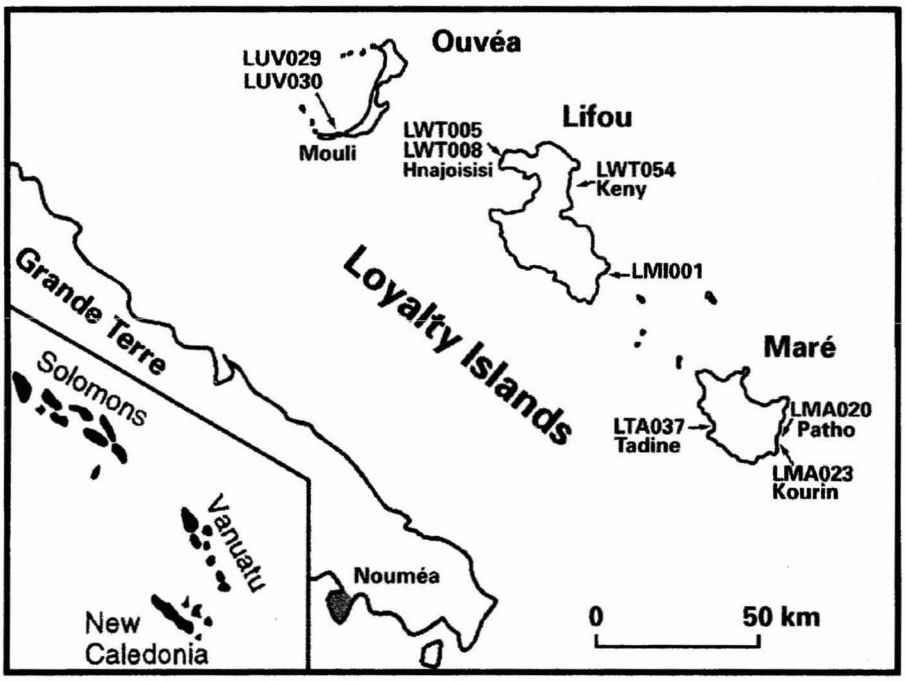

Fig. 1. Map of the Loyalty Islands, showing locations of the sites discussed.

composed of uplifted coral platforms of varying elevations. Ouvéa is an uplifted atoll on its eastern part, with a wide lagoon. Lifou and Maré are completely uplifted coral platforms, with a flattened central area corresponding to the former lagoon and higher cliffs related to the former reef. Some summits on Maré Island are over 140 m high. The shorelines can be divided between low areas, where quartenary sand dunes have sometimes formed, and high coral cliffs, showing the notches of former sea levels. No streams are present in the archipelago. Apart from Maré, which has a small source of easily identifiable basalt in Rawa, the Loyalty Islands are completely formed by coral lithology and no stone sources of sedimentary formation are present.

The vegetation is diversified, and depends partly on the type of soils present. The coastline has mainly a dry vegetation characteristic of coral soils (bourraos, coconut palms, and so forth). Massive forests have grown on the uplifted plateaus. This has led to the formation of an often fertile soil layer used for horticultural activities. Maré Island is renowned for its long yams, and on Ouvéa Island wet taro cultivation is practiced in pits.

Present-day human settlements are located mainly around the Christian missions. This led to the abandonment of numerous traditional habitation sites during the second part of the nineteenth century. The indigenous social system is formed by chiefdoms, whose territories were apportioned among autonomous districts.

The prehistoric chronology of New Caledonia, which will be referred to in this paper, has been divided into two major periods (Galipaud 1992; Sand 1995*a*, 1996*a*). The Koné period, from around 1000 B.C. to A.D. 200, is characterized

mainly by the presence of dentate-stamped Lapita, paddle-impressed Podtanean, and incised Puen tradition pottery. The subsequent Naïa-Oundjo period is characterized in southern Grande Terre by the Plum tradition of handled pots during the first millenium A.D., and the Nera tradition of incised and nubbin pots during the second millenium A.D. In northern Grand Terre, the first millenium A.D. seems to be characterized by small Balabio pots and in the second millenium A.D. by larger Oundjo tradition pots.

PREVIOUS ARCHAEOLOGICAL RESEARCH IN THE LOYALTY ISLANDS

Maré Island has received most of the attention by archaeologists over the past forty years, especially through the pioneering studies of Dubois. By the 1940s, through his collection of numerous oral traditions and genealogies of the different clans of the island, Dubois had identified various archaeological sites of great importance, such as the Hnakudotit wall (O'Reilly 1950; Dubois 1970) or the Lapita sites of the Patho-Kurin area. He was also responsible for dating human remains from the Pheu rockshelter, with a result of "1680 ± 80 before the Christian era" (Dubois 1981:6, trans. Sand). Another date was provided by archaeologist R. Shutler from a coastal site in Wabao (site 6), with an age estimated to be 2000 years (Huntley et al. 1983). Salvage excavations of five human skeletons recovered in 1977 by Maitre from site LMA001 at La Roche, dated to 1040 ± 110 B.P. (LY-2310), cal. A.D. 775–1230 (Evin, personal communication, 1994; Valentin 1996).[1] For the local cultural office, Galipaud relocated the Lapita site of Patho (LMA020) and conducted excavations there in 1987 and then in 1991 for ORSTOM, with the assistance of A. M. Sémah. The archaeological layer was dated to 2590 ± 110 B.P. (ANU-6616), cal. 400–930 B.C., and to 2500 ± 90 B.P. (Beta-50604), cal. 390–820 (630) 390 B.C. (Sémah and Galipaud 1992), representing the oldest known human presence on Maré at that time.[2]

While some sites were identified during the 1980s on Lifou and one test pit (unpublished) was excavated in Luecilla by Galipaud, certainly the most neglected island before our survey was Ouvéa. Only one date was known, from sherds discovered in Muli that are approximately 200–100 years old (Huntley et al. 1983).

THE CURRENT SURVEY OF THE LOYALTY ISLANDS

The current survey began in 1992 (Sand et al. in press) and has since identified and cataloged more than 350 new archaeological sites, mainly composed of habitation sites, rockshelters, burials, constructed walls, horticultural structures, and caves. Surface collections of archaeological material have provided the first general outline of the relations between the Loyalty Islands and Grande Terre of New Caledonia during the prehistoric period, through the study of pottery, lithic flakes and other forms, and adzes. This has shown (Sand 1995*a*) that during the last two millenia, interaction and possibly movement between these two geographic areas was regular, leading to the presence in some sites of sherds of Plum and Nera traditions (from southern Grande Terre) and of Oundjo tradition (from northern Grande Terre). Sherds linked to pots made during the first millenium B.C. also have been discovered in Maré (La Roche, Wabao), Lifou (Hnatalo and Kaw area), and Ouvéa (Fayaoué) (Sand 1995*a*). But these markers, although

important for a general identification of relations between the islands, do not allow by themselves the precise description of the different chronological periods and the variation in the cultural complexes. Archaeological excavations have thus been undertaken in order to date undisturbed archaeological layers and obtain new analyzable remains.

THE EXCAVATIONS

The first program of heritage preservation and reconstruction was begun in 1992 by the Department of Archaeology on the forts of Hnakudotit and Waninetit (Sand and Ouetcho 1993*b*: 61–73; Sand 1996*b*). In concert with a hotel-building project on Qanono beach (Lifou), a salvage excavation was conducted in 1993, with the dating of a buried archaeological layer about 4 m under the present surface to 1690 ± 60 B.P. (Beta-62641), calibrated A.D. 260–425 (Sand and Ouetcho 1993*b*: 74–87). Some of the sites discovered during the surveys were subjected to slow destruction processes, and we asked the Loyalty Islands Province for authorization to conduct eight new excavations on Lifou, Maré, and Ouvéa between 1994 and 1995.

Rockshelter LWT008 at Hnajoisisi (Lifou Island)

The small coastal area that forms the shoreline of the territories of the Siloam and Hanawa groups, in the northwestern part of Lifou Island, is not settled permanently at present, in the absence of a sheltered bay. The Hnajoisisi area forms a plain at the back of the coastline, between 5 and 10 m above high tide and between 100 and 300 m along its largest part, limited by an uplifted coral cliff up to 20 m high. During episodes of sea stability, waves created notches at various heights and depths in the coral. Rockshelter LWT008, excavated in 1995, is located in one of these notches, with a contemporary summit located at 14 m above high tide and a crumble-cone about 4 m high. The rockshelter has a surface of about 40 m^2, limited today by a wooden construction with a fence and a roof.

A 1 m^2 test unit was excavated in the center of the shelter. The excavation was conducted by artificial 10 cm levels down to the bottom of the unit, which is a coral platform between 110 cm and 130 cm deep. The infilling of the rockshelter is formed mainly by a succession of ash lenses incorporated in a sediment developed during human occupation of the site. Two distinct stratigraphic units have been identified, based on the type of sediment and its formation. The upper unit, which extends to 45 cm deep, is formed mainly by the superposition of white and gray ash lenses, both with abundant charcoal, indicating the use of this part of the rockshelter as a burning area. This unit can be divided into three levels (A, B, and C). The lower stratigraphic unit, between 45 cm and the base of the infilling, is formed by three dark brown sediment levels with less charcoal (D, E, and F). The compositional difference between the two units is clearly visible in the stratigraphic profile and indicates two rather different episodes during the shelter's occupation, as indicated also by the archaeological material. One of the particularities of the stratigraphy is the identification of some activity zones in the back of the rockshelter (east), which do not continue to the front of the

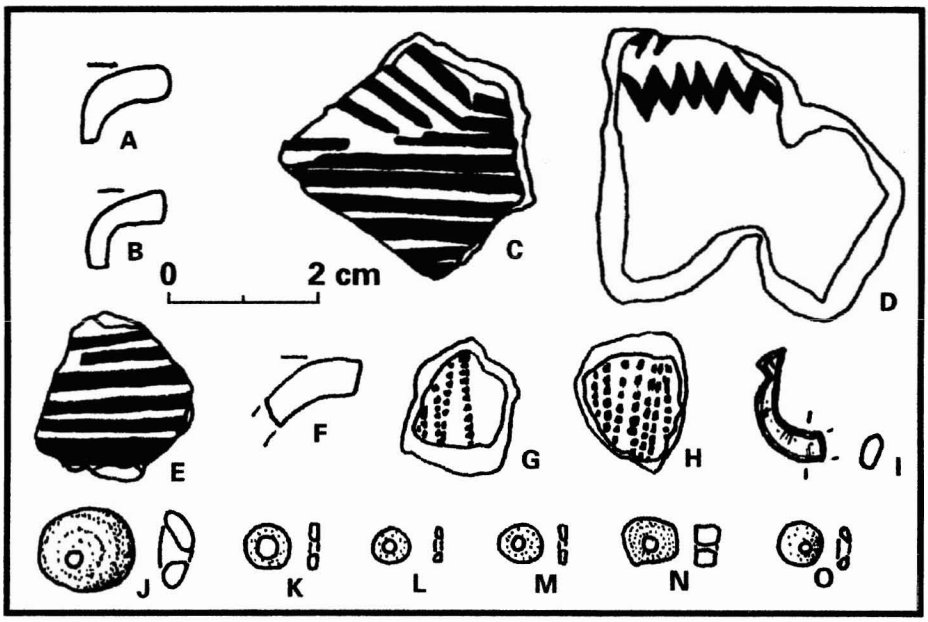

Fig. 2. Artifacts from Rockshelter LWT008, Hnajoisisi, Lifou Island. A–B: Rim sherds (Podtanean); C: Paddle-impressed sherd (Podtanean); D: Solid decoration on sherd (beginning of first millenium B.C.); E: Paddle-impressed sherd (Podtanean); F: Outcurved rim sherd (Lapita); G–H: Dentate-stamped sherds (Lapita); I: Turbo-shell fishhook; J: Strombus-shell fishhook; K: Gasteropod-shell fishhook; L–M: Gasteropod-shell beads; N: *Heterocentrotus mamillatus* bead; O: Strombus-shell bead.

shelter (west). The test unit is probably located at the limit of the former occupation area permitted by the coral cliff.

All of the sediment was wet screened using 3 mm screens. This allowed the recovery of small sherds tempered with coral sand, most of which were less than 1 cm^2 in surface. In terms of the distribution of material recovered, the difference between the upper unit, with very little material, and the lower unit is clearly identifiable.

The presence of pottery sherds is limited to the lower unit (Fig. 2). The basal level is associated with red-colored sherds, highly tempered with coral sand. In the lowest level, F, between 120 and 130 cm, three types of decoration have been identified: (1) three sherds have a dentate-stamped decoration characteristic of Lapita, with parallel or arced stamps; (2) two sherds have a wavy decoration, made from the same kind of tools as the dentate-stamped decorations, but without the teeth; and (3) three sherds have a wavy decoration made from a bivalve shell that forms irregular dentate-stamped impressions. Although sherds with the same kind of paste, mainly a high proportion of coral sand temper, are present up to 80 cm deep, the types of designs observed in the bottom of the stratigraphic unit have not been identified higher in the unit. The only type of decoration present in the other levels of D, E, and F are paddle-impressed and assigned to the Padtanean tradition. Only three out-curved rims with a flattened lip, one collar sherd, and two low-angled carenations have been identified. All of these characteristics clearly place these pots chronologically in the Koné period, which is consistent with the decorations. A study of the inclusions of the sherds from

Hnajoisisi is underway in order to identify the locations where the ceramics were produced; they are probably from Grande Terre. Preliminary observations have already helped identify some differences. One of the sherds from 100–110 cm deep with smoothing striations on its outer surface has a fragment of chrome about 4 mm in diameter within its coral sand temper. Five sherds from level E and one sherd from level D, of a clear brown color, are not tempered with coral sand but have quartz as inclusions.

Most of the lithic flakes recovered are made from a siliceous stone (phtanite type) of light green, present mainly in level D with 32 specimens. Three of these flakes bear marks of polishing, leading to the hypothesis that this concentration is the result of the sharpening of an already polished adze. The presence of four flakes of grey phtanite, two flakes of flint, and one flake of schist, all sourced to Grande Terre, shows the link with Lifou Island during the Koné period. The occupants of the Hnajoisisi rockshelter also brought with them particular objects collected near the site, as is shown by the presence of three pebbles of stalactite, polished and rounded. The only nonlocal rock identified in the upper stratigraphic unit comes from level B and is probably an oven stone. A large net ballast made from a stalactite has been found in level C (27–45 cm deep).

The number of shells showing intentional marks of breakage or polishing is low, as with the coral fragments. In level D a flake of pearl oyster with a sharp edge has been identified. A fragment of Turbo shows signs of cutting, possibly resulting from a hook preform. A hook made from the same variety of shell has been found in level E. Broken at its point, it has a notched head attachment. Another hook, larger in size and very damaged by fire exposure, has been identified in level A, and one preform of a small hook has been found in the lowest part of the stratigraphy at 120 cm deep. The poor conservation of these two objects renders the reconstruction of the original form difficult. However, these are the first discoveries of fishhooks on Lifou Island.

The Hnajoisisi excavation also led to the discovery of several ornaments. Sieving with fine mesh has recovered small polished beads, never before found in the Loyalty Islands and found in only two sites on Grande Terre. One bead is simply made from the spine of the urchin *Heterocentrotus mamillatus*, drilled and probably strung. Two extremities of small shells of *Strombus* have been polished and drilled. Finally, four small flat beads have been made out of a gastropod. They are aproximately 6 mm in diameter and 1 mm thick, and come from 80–110 cm deep. Objects of European origin are concentrated in the upper 20 cm, which corresponds to level A.

The diagram of the distribution of shells shows a marked difference between the upper and lower stratigraphic units. In the upper part of the sequence, the number of shells is low, with no more than 500 g of gastropods. The proportion rises steadily in level D, with its maximum in level E (with more than 3000 g of gastropods between 70 and 80 cm). Also significant is the large proportion of gastropods, which represent the majority of the collection. This can be explained by the marine environment of most of the Loyalty Islands, with few natural habitats favorable to bivalves. During excavation, the large proportion of slate-pencil sea urchins (*Heterocentrotus mamillatus*) identified in the lower unit led us to pay particular attention to their distribution (Fig. 3). The highest proportion exists between 60 and 90 cm, with a maximum between 70 and 80 cm, as with the shells. This large proportion in the stratigraphy is in marked contrast with the

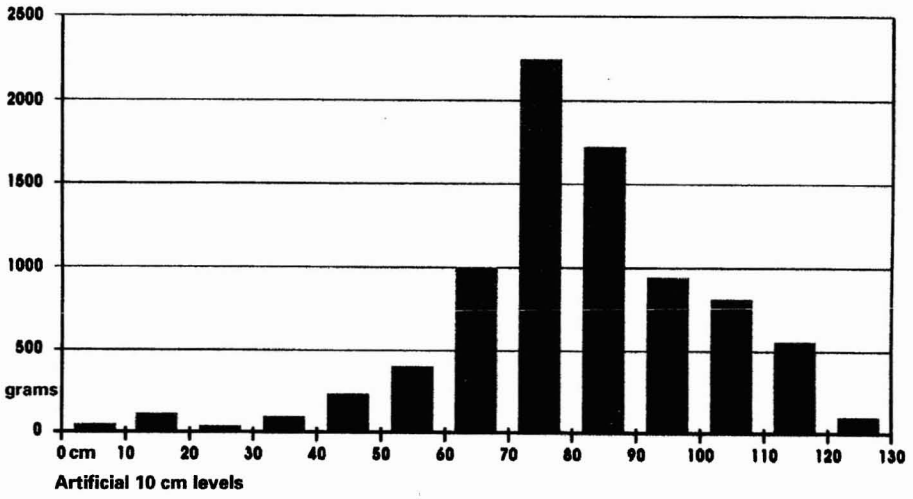

Fig. 3. Distribution by weight of slate-pencil sea urchin spines (*Heterocentrotus mamillatus*) in the different layers of site LWT008, Hnajoisisi, Lifou Island.

present-day situation. Only two living slate-pencil sea urchins were observed during dives in Hnajoisisi. This indicates the nearly complete disappearence of this species on this part of the coast. A large number of bones, from fish and birds, have been collected during the excavations. The largest concentrations come from the levels of the lower unit.

The importance of the archaeological results obtained from this excavation prompted us to date the temporal limits of the different stratigraphic units as precisely as possible. Four dates have been run on this site. The base of the stratigraphy, associated with the dentate-stamped Lapita sherds, has been dated after C13 correction to 2710 $\pm$ 60 B.P. (Beta-88506, CAMS), cal. 780–915 B.C. The central part of level F, at 110 cm deep, has been dated after C13 correction to 2760 $\pm$ 60 B.P. (Beta-80045), cal. 795–990 B.C. This date is consistent with the previous one and confirms the early occupation of this rockshelter, along with the lower limit of the appearence of the sherds with paddle impressions. The limit between D and E, at 70 cm deep, has been dated after C13 correction to 1370 $\pm$ 60 B.P. (Beta-88505), cal. A.D. 630–855. This recent result is unexpected and should be confirmed by further dating before it is treated as a reliable chronological marker. The most recent date comes from level C, at 40 cm deep. The result, after C13 correction, is to 1250 $\pm$ 60 B.P. (Beta-88504, CAMS), cal. A.D. 680–980. This result suggests that the preceding date is possibly wrong.

The major discovery of the excavation is the presence of archaeological levels extending back to the beginning of the ceramic settlement of New Caledonia. Because of the small size of the rockshelter, this had not really been expected. The presence of an early human occupation at Hnajoisisi has now been independently confirmed by the dating of the lower unit of the nearby rockshelter LWT005 (after C13 correction) to 2600 $\pm$ 50 B.P. (Beta-109375), cal. 560–825 B.C. The presence of a few Lapita sherds at the base of this unit was unexpected. This is the first time that sherds of this tradition have been found in a rockshelter in New Caledonia. This posed a question regarding Lapita ceramics,

whose distribution is now mostly seen as having a ceremonial function (Kirch 1997; Spriggs 1997). Why did the first inhabitants of Hnajoisisi bring Lapita vessels to this small shelter, which was probably not the main habitation place? The answer to this cannot be determined solely from the small test excavations made in 1995 and would require the opening of a larger area to define the internal organization of the occupation. The second aspect of the decorated sherds is the presence, in the lowest level and in association with dentate-stamped sherds, of full-stamped decorations (technically identical to some Lapita decorations) and shell-stamped decorations. This shows the existence, in relation to classic Lapita, of other forms of decorations from the beginning in the ceramic chronology at Lifou. This new data is important, as it shows some of the diversity of the first ceramic tradition and the possibility in the Loyalty Islands of other early sites with these non-dentate-stamped decorations. They may date, as shown from the results obtained at Hnajoisisi, to the earliest occupation of the archipelago.

The disappearance of the stamped decorations in successive levels and their replacement by paddle-impressed sherds of Podtanean tradition indicates an evolution of the use of the site as well as a shift in the local ceramic chronology. All of the sherds bearing paddle impressions are tempered with coral sand and were used as cooking vessels as shown by residue remains visible on some sherds. The possible persistence of this ceramic tradition to the middle of the first millenium A.D. indicates the duration of the Podtanean tradition in the ceramic chronology of the Loyalty Islands. This had not been precisely identified, because of the absence of excavations at non-Lapita sites. It is also similar to what is known in northern Grande Terre, although the length of this tradition as identified in Hnajoisisi has no parallel in the archipelago.

Interaction with Grande Terre is clearly identifiable by the presence of chrome as a tempering material. The presence as early as level F of three sherds with a lithic temper may allow us to locate the geographic origin of the pottery found in this site. Some of the sherds from the Patho site on Maré Island probably come from northern Grande Terre (Galipaud 1990), and one goal is to determine if this region was the major area of ceramic production during the Koné period for the Loyalty Islands or if there were multiple trading points (Sand 1995*a*). Interaction with Grande Terre is also identified through the lithic material sourced to the large island. Although this consists of mostly small fragments of phtanite and flint, their occurrence confirms the existence of relations outside Lifou Island. The identification of debitage from a polished adze of a rock characteristic of the adzes of the Koné period on Grand Terre may indicate that this type of nonlocal material acquired a certain value in the local island society.

Although the identification of the bone material is not yet completed,[3] the discovery of three fish hooks and of a possible hook preform is of major importance for the reconstruction of the subsistence strategies in the Loyalty Islands during the Koné period. Previously, the absence of hooks in prehistoric sites had led archaeologists to hypothesize that fishing in New Caledonia had been practiced mainly with nets or by hand (Frimigacci 1980 : 9). The Hnajoisisi hooks, along with those found in site LTA037 of Hnenigec on Maré (see below), show the presence of an established tradition of simple hooks in the Loyalty Islands.

These results allow us to propose three hypotheses. First, it is possible that at first settlement sand dune formations covered part of the low uplifted coral for-

mations, allowing an easier access from the sea to the plain. The presence of a sand lens in the bottom of the test pit could indicate the presence of a former dune, which would have been washed away after major natural events, as can sometimes be observed today. Second, one characteristic of the Hnajoisisi area is that this is the westernmost point of northern Lifou facing Grande Terre. It may have been a stopping point for canoes crossing this sea gap. Third, it is possible that our view of the human settlement of the Loyalty Islands is too narrowly focused, assuming that the first groups settling an island remained restricted during a long time to a given place around their habitation area. On the contrary, it is possible that in low fertile coastal areas such as Lifou, groups rapidly settled over a large geographical area, although keeping relations with the original place of settlement. This hypothesis can be properly tested only after the excavation of other rockshelters and open sites in northern Lifou, and the comparison of the different dates and materials obtained.

The upper 45 cm of the deposit is in marked contrast to the older portion of the unit. The near total absence of cultural material, as well as the marked reduction in shellfish remains and the change in the nature of deposition, mark a shift in the use of the shelter. The absence of recent-period sherds may also indicate a less intense use of the Hnajoisisi area during the last two millennia, with a possible shift of the habitation zone, or a reduction in interaction between the inhabitants of this part of Lifou and Grande Terre.

Dune Settlement LWT054 at Keny (Lifou Island)

The east coast of the Wetr district, from the Ejengen area in the north to Châteaubriand Bay in the south, is formed by a succession of sand dunes facing a fringing reef about 250 m wide. These dunes protect a plain formed by a coral plateau between 100 and 500 m wide, which leads to a coral cliff with a maximum elevation of 80 m. The Keny site is located in the northern part of the plain. A pass exists in the reef a short distance to the south, providing good access to the sea. The area (Fig. 4) can be divided from east to west into five parts, starting from the coastline: the beach, the dune, the nonpermanent habitation zones, the cultivated plain, and the uplifted coral plateau. Keny was the place of the former chiefdom of Wetr, which moved to the Hnathalo plateau after Chris-

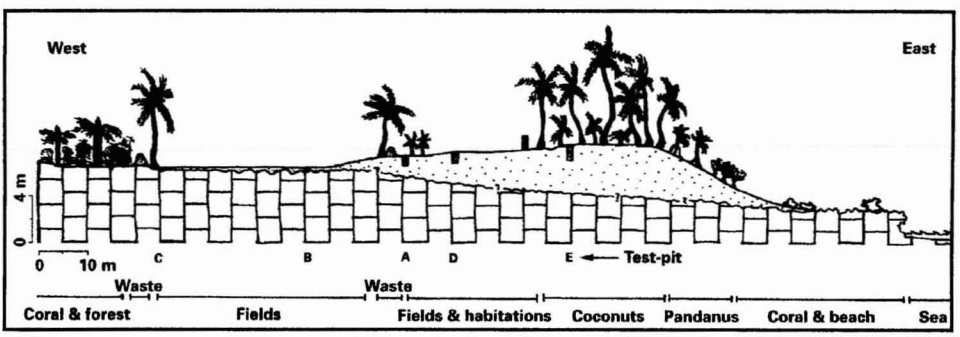

Fig. 4. Distribution of test excavation units at LWT054, Keny, Lifou Island.

tianization. The remains of a dwelling surrounded by a palisade are still visible, showing the location of the former chiefdom as well as the traditional spatial organization.

During the 1993 survey, surface collection in the fields at this site led to the discovery of sherds bearing dentate-stamped decorations of Lapita style. The back portion of the sand dune shows signs of cultivation activities, and we conducted extensive surface collection in order to identify the different types of material present in the site. Most of the sherds are of Lapita tradition (with the presence of carenations and outcurved rims, sometimes with notched lips), mostly with a nonabundant coral sand temper. Some sherds bear shell stamping. No sherds with paddle impressions were discovered. The second part of the ceramic sequence is indicated by the presence of one Plum tradition sherd, six Néra tradition sherds, and one Oundjo tradition sherd (identified by temper identification). This shows the successive interactions with Grande Terre during the first and second millenia A.D., although the archaeological remains are far less numerous. In association with the ceramic material, lithic remains were found, characterized mainly by phtanite flakes, as well as one crystal flake, two flakes of a brown flint, and one polished adze flake in a black siliceous rock. All these remains most probably source to Grande Terre.

Five test units of 1 m^2 each were excavated at site LWT054 of Keny (Fig. 4). The sediment was sieved in 3 mm screens. Each test unit is described here with its associated material. Unit A was located at the back limit of the sand dune, near the fields. The excavation was conducted up to 95 cm and led to the identification of seven stratigraphic layers. The archaeological formation ended at layer 6 (30–45 cm deep, up to 60 cm deep in associated pits), which was the only layer with pits, including one in the southeast corner and a possible posthole in the northeast corner. Few archaeological remains were found in the excavation, with a low concentration of sherds in the four upper layers (only five sherds), eight sherds in layer 5, and three sherds in layer 6 (Fig. 5). Decorations on the sherds are dentate-stamped or impressed and one rim has a decorated lip. Test pits B and C were located in the center and at the back of the horticultural zone. They revealed the existence of a thin and overturned cultivated layer. Test pit D was placed on the sand dune near the habitation fence, nearer to the seashore than test pit A, with the hopes that this zone would be less disturbed. Five stratigraphic layers were identified. Only the two uppermost layers, descending to 35–45 cm deep and containing a pit up to 120 cm deep, had archaeological remains. In the upper 20 cm, a phtanite flake, a conus shell ornament, and six sand-tempered sherds were found. The material from layer 2 is also limited, with six sherds, all tempered with coral sand except for one sherd found at 25 cm deep and probably of Néra tradition. An outcurved rim has three forms of decoration on it: dentate stamping, impressions with a flat tool, and paddle impressions. Test pit E was placed at the highest point of the dune, just near the road. Six levels were identified, up to a depth of 105 cm containing archaeological remains (level 5), extending to 150 cm deep in a pit in the southeast corner. The material was concentrated in two depths: one in the upper 40 cm of the stratigraphy and the other in the basal level 5. The only in situ pottery came from 90–100 cm deep. They are all sand tempered. One large out-curved rim and two smaller rims bear a notched lip. One sherd has an impression made with a flat tool and one has a

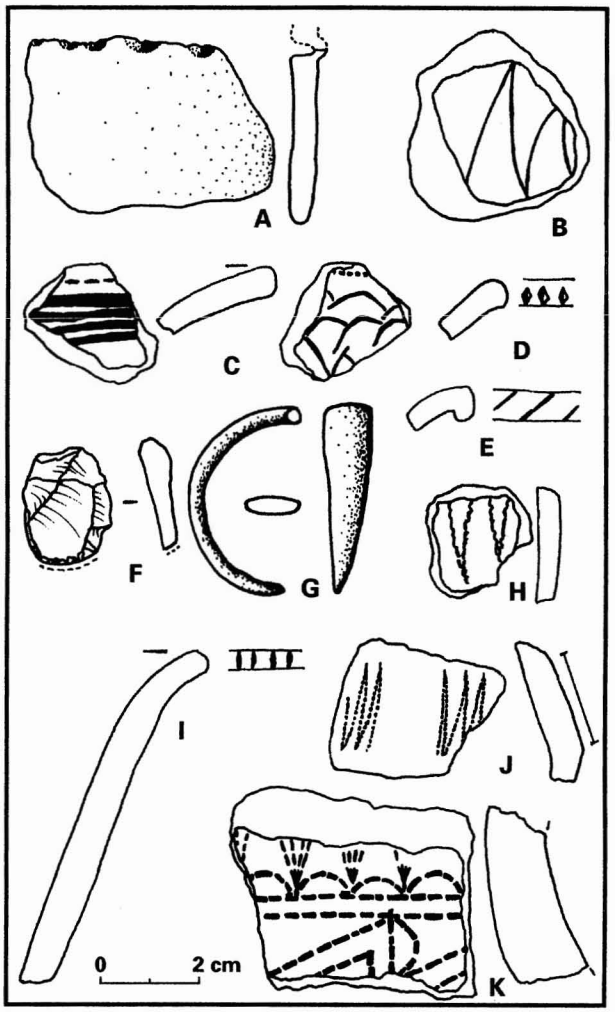

Fig. 5. Artifacts from LWT054, Keny, Lifou Island. A: Nubbin-decorated sherd (Nera); B: Impressed sherd (first millenium B.C.); C: Outcurved rim with paddle-impressed, dentate-stamped and impressed decorations; D: Outcurved rim with notched lip; E: Outcurved rim with impressed lip; F: Worked phtanite flake; G: Conus-shell ornament; H: Shell-impressed sherd (first millenium B.C.); I: Outcurved rim with notched lip; J–K: Dentate-stamped decoration (Lapita).

dentate-stamped Lapita decoration. The only sherd found at the base of the excavation, although not decorated, has abundant coral sand temper. One charcoal sample taken from this level (95 cm) has been dated, after C13 correction, to 2680 ± 60 B.P. (Beta-82661), cal. 770–900 B.C. This date fits well in the chronology identified for the Lapita sites of New Caledonia (Sand 1997).

The excavations conducted at site LWT054 of Keny have helped to clarify the oldest archaeological layers present at the dune and the cultivated plain. It appears that much of the site has been disturbed by cultivation activities, probably over the last 2000 years. In all the units, the lowest archaeological layer is underlaid by a layer of yellow pumice, a comparable situation to that observed in the earliest sites of Grande Terre. The discovery of an in situ layer at the top of the dune distinguishes it from other dune sites such as Qanono in Lifou (Sand and Ouetcho 1993*b*) and Patho on Maré (Galipaud 1995), where the formation of the dune postdates the first human settlement. The limited amount of material discovered,

from surface collections and in excavations, indicates that we may not have found the central area of the first occupation. The dating of the basal part of the site to 800 B.C. makes Keny for the moment the oldest dated dune site of Lifou Island, although possibly earlier sites have been located in the southwest coast (Sand et al. in press).

The Destroyed Shelter LTA037 at Hnenigec (Maré Island)

As part of the economic development of Maré Island, construction of a quay was begun in 1993 at Tadine on the west coast. Fill was made available by quarrying a fossil coral deposit situated at the summit of the plateau overhanging the Tadine group. The considerable quarrying of the scarp resulted in the destruction of a number of recesses used as burial sites and a large rockshelter. Only the northern extremity of the zone where the destroyed shelter is found was intact, and then only because a snake associated with one of the clans that control this site is thought to inhabit a ledge there. Thus a section of the original scarp has been saved, surrounded on all sides by evidence of the quarrying. In 1994, Wadra and Gorecki informed us of a stratigraphic section at the site, and several minor excavations were carried out there from the end of 1994 to the beginning of 1995. In view of the small number of archaeological deposits remaining intact and the discovery of a large number of human bones, it seemed advisable to carry out a general preliminary study in order to plan a later exhaustive excavation.

The shelter is situated about 1500 m inland on the uplifted coral platform of Hnenigec, which has a highest point at 92 m altitude. The scarp is about 20 m high. In the shelter, there remains a face of a stratigraphic section, 4 m in length and less than 1 m in depth. During the first period of fieldwork in December 1994, excavation was carried out in the northern part of the section. Archaeological material was collected at different levels but the complicated stratigraphy throughout the upper part of the deposit has not produced a satisfactory drawing of this section. During the main excavation in February 1995, a stratigraphic excavation was undertaken only at the back of the shelter within the outermost edge of the layers still in place.

All of the deposit found in the first two meters of the front part of the shelter, formed from strata that had been disturbed by heavy machinery, was examined to locate any archaeological material present. Only a few remains were found. Of note among the ceramic material were sherds of the Nera tradition, one of which is decorated with nubbins; sherds from the Podtanean tradition bearing paddle impressions; and sherds similar to those of the Koné period, bearing traces of smoothing on the outer faces. Among the lithic materials was a polished slab of grey-green schist of the same type as those found on several ancient sites on the west coast of Grande Terre and associated with geological formations on the northeast coast of the island. A simple pearl oyster fish hook was the only shell object found.

The excavation carried out in the north zone of the shelter produced an assemblage of the archaeological material according to major levels even though no study of the disturbed stratigraphy was attempted. Most of the ceramic material was composed of sherds decorated with paddle impressions. A partial reconstitution of one of these paddle-impressed pots has been possible thanks to the

presence of a rim and a carenation that could be joined together. The only other ceramic tradition of which remains have been found at the site is represented by four thick sherds from a globular, thick-walled piece of pottery. After visual observation of the fine temper, these sherds have been provisionally identified as characteristic of the Oundjo period with an origin in northern Grande Terre. Only three finds are of nonceramic material: a phthanite flake, a fragment of a cone-shell bracelet, and a fragment of a phtanite adze with a cut edge.

The only systematic excavation was carried out on a bank 280 cm long and, on average, 40 cm wide, situated at the edge of the zone that had been disturbed by bulldozing. The excavation was carried out in artificial stratigraphy and all of the sediment was sifted. We discovered in the southern section a pile of human bones. In all, seventeen different stratigraphical layers could be recognized, which were divided into seven overall levels.

There was not a great deal of ceramic material recovered. In all, only six sherds were found. A sherd discovered in the fifth level belongs to the Nera tradition. The other five sherds discovered in levels 6 and 7 are all of the Podtanean tradition. All are finely tempered and have strong walls, and three have paddle impressions. Little lithic material was present; in the third level, a fragment of an adze in greenstone (semi-nephrite) and a flint flake were found. In the fourth level there were two flakes of grey phthanite. The most unexpected finds were two fragments of green nickel in level 5. This is the first clear evidence in a prehistoric site of the transport of nickel ore from New Caledonia. Lastly, the presence may be noted of a small elongated adze of siliceous rock, trapezoidal in section, related typologically to the adzes of the Koné period.

Shell objects identified during the excavation all come from level 6. A fragment of a cone shell bracelet was found in association with the human bones in layer 11. Two fish hooks, likely of oyster shell (one of which was burnt [layer 15]), an unfinished turbo fishhook associated with a dozen worked fragments (some of which are clearly related to the making of fishhooks), demonstrate the presence of activities concerned with the fabrication of fishing tools. An oyster shell in which the surface had been partly polished and a cut fragment of a giant clam shell come from the base of level 6.

An anthropological study of the human bones discovered in layer 11 during the Hnenigec excavation was carried out by Valentin (1996 : 18–27). The partial excavation of the pile has led to the recognition of 130 bones representing at least seven individuals. The presence of long bones such as thigh bones, shin bones, and radii, and of pelvic and vertebral fragments, show that most skeletal components are represented. The piling up of the bones observed during the excavation suggests that the skeletal remains were not in anatomical position when they were covered up. This kind of arrangement is common in cemeteries found today in limestone shelters. It may well indicate that the skeletons were placed above ground at the back of the shelter for a time before being buried. Signs of cutting and of burning were observed on certain bones but it has not yet been possible to ascertain their origin.

Three dates were produced from the site. Layer 10, which covers level 6 containing the pile of bones, has been dated, after C13 correction, to 510 $\pm$ 110 B.P. (Beta-82664), cal. A.D. 1295–1655. This date, even though recent, corresponds chronologically to the identification of the sherd from layer 10 as being from the Nera tradition. A second date is available from the base of the disturbed stratigra-

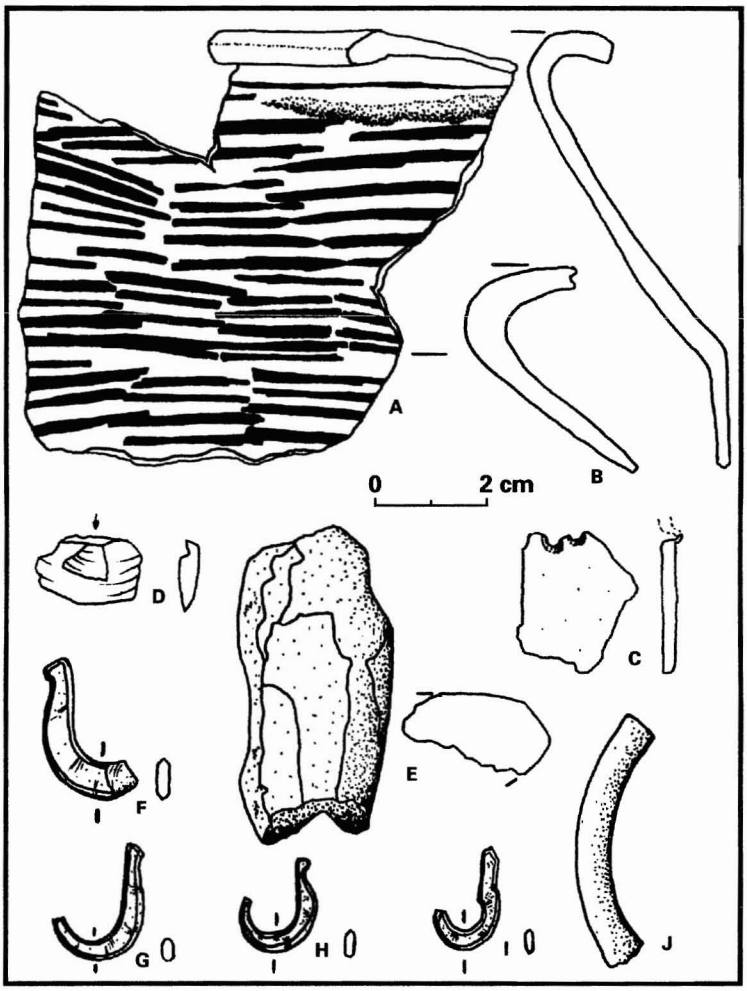

Fig. 6. Artifacts from Rockshelter LTA037, Hnenigec, Maré Island. A: Carenated paddle-impressed rim sherd (Podtanean); B: Outcurved rim sherd with grooved lip; C: Nubbin-decorated sherd (Nera); D: Phtanite rock flake; E: Polished grey-green schist fragment; F–H: Oyster-shell fishhooks; I: Turbo-shell fishhook preform; J: Fragment, Conus-shell armring.

phy, on carbon samples associated with the vessel rim that has a grooved lip. The result, after C13 correction, is 1210 ± 110 B.P. (Beta 89087), cal. A.D. 655–1040. A third date has recently been obtained from samples of the human bones found in Layer II. The bones have been dated, after C13 correction, to 1775 ± 60 B.P. (Lyon-521), cal. A.D. 125–400.

The results obtained during the salvage excavations undertaken in shelter LTA037 at Hnenigec (Fig. 6) should encourage further research, for the study of the site has only just begun. Despite the absence of the oldest levels of occupation, which disappeared with the destruction of the front part of the shelter, the presence of sherds so clearly belonging to the Podtanean tradition demonstrate that the site was occupied from the Koné period onward. In level 6 the presence

of the remains of fishing tools shows that activities connected with the sea took place even on sites relatively distant from the coast. The number of fish hooks discovered at this site is the largest found on any site in the New Caledonian archipelago. As yet it is not possible to ascertain the precise nature of the human occupation of the Hnenigec shelter. It appears, from the dates and the ceramic material, that there is a chronological gap of about 1000 years between levels 6 and 5. There are also far fewer remains in the upper levels. The presence of human bones suggests that the shelter became a place for funerary rites. The recent reoccupation occurred after the complete burial of the bones.

Rockshelter LTA042 at Peete (Maré Island)

During the first human occupation of the west coast of the island of Maré, the rock shelters of uplifted coral platforms, situated less than 300 m from the coast, must have been propitious sites for recurring use. During the survey a large accumulation cone was reported in front of one of these uplifted sites at the locality named Peete. The Peete shelter forms the upper part of this uplifted coral platform about 10 m above the coastal plain. The shelter is composed of two rooms. Sloping down from the front of the shelter is a large accumulation cone over 25 m long on its north-south axis and about 10 m high at the shelter entrance.

Two test units, each 1 m^2, were set up at the front of the shelter. The excavation of unit A, the most central, was 90 cm deep and eight stratigraphic layers were recognized, made up mostly of ash. In the eastern wall of the third layer a stone oven was excavated, suggesting that the shelter had had a relatively permanent occupation. At the base of layer 5, another oven was found that was divided into a compact orange-colored sill and a zone of white hardened ash. The presence of the sill may indicate a relatively long or intensive use of the hearth. Layer 6, measuring about 20 cm in depth, was the thickest layer in the unit. Bedrock was reached at a depth of 50 cm in the southeast zone, but the deposit descends relatively abruptly to a depth of 90 cm in the north zone. The different layers, clearly recognizable in the part of the test pit oriented toward the interior of the shelter, were far less marked along the opposite profile. This suggests that continuous erosion has led to the development of the cone of debris at the front of the site.

The presence of a large fallen roof slab at the base of unit A led to the excavation of a second unit. Excavation unit B is composed of seven layers, mostly of ash. The base of the shelter was reached in the eastern and southern parts at a depth of 50 to 95 cm.

With the exception of the second layer, all other layers in the two test units tallied. Layer 3 of test pit A corresponds to that of test pit B and so on through layers 4 to 7. This correspondence makes it possible to show that despite the disturbances observable in the upper layers, the stratigraphy of the shelter is relatively intact.

Ceramic material discovered in unit A was confined to the lower layers up to layer 5. All of the material is tempered, at least partly, with coral sand. The presence of paddle impressions, a carenation, an outcurved rim, and a smoothed sherd show that these sherds are of the Podtanean tradition. The largest concentration of sherds occurred in layers 5 and 6. The rest of the material of this test pit was characterized by a glass flake in layer 2, a bead of lead shot at the top of

layer 3, a fragment of cut turbo shell (possibly a fish hook) in layer 4, and a small brown fragment of phthanite with a cutting edge in layer 6.

All of the ceramic material in unit B came from the thick layer 6, except for five small sherd fragments discovered in layer 7 that were probably not in their original stratigraphic position. All the large sherds are tempered with coral sand and carry paddle impression decoration, characteristics of the Podtanean tradition. The presence of a rim and of two reassembled sherds should be noted. The lithic material, characterized by a polishing stone with a tapering end and a fragment of a phthanite adze, came from layer 6. A small shell bead was found at the top of layer 6. Also found in the same layer were a fragment of cut nautilus shell and the pierced end of a cone shell.

Two dates are associated with this site. The first was carried out on samples taken from the base of layer 6 in test pit A (70–75 cm) and gave a date, after C13 correction, to 1850 ± 60 B.P. (Beta-82662, CAMS-20796), cal. A.D. 85–390. To confirm this recent date a second sample was submitted on material from layer 6 of unit B (50–60 cm) and gave a result, after C13 correction, to 1580 ± 60 B.P. (Beta-89086), cal. A.D. 410–650.

The excavation at shelter LTA042 at Peete revealed the existence of an ancient archaeological level characterized principally by the presence of sherds from the Podtanean tradition. The dating of the main layer to the middle of the first half of the first millennium A.D. demonstrates the persistence of the fabrication and/or utilization of pottery with paddle impressions and tempered with coral sand during the first millennium A.D. This had been suggested by the recent dating of the basal layer D in shelter LWT008 at Hnajoisisi. The exact provenance of these pots must now be better established because their presence extends the interval for the Podtanean tradition beyond the chronology known from excavations on Grande Terre. This material also contradicts the hypothesis that there was an abrupt cessation in the use of coral sand in the fabrication of ancient pots in New Caledonia (Galipaud 1990).

The small amount of archaeological material, including shells and bones, found during the excavation shows that the use of shelter LTA042 at Peete was not permanent, at least from the beginning of the first millennium A.D. when a sedimentary layer was already in place. The uniformity, without other strata, of layer 6 in units A and B suggests that the sediment accumulated fairly rapidly. The difference between this layer and more recent ones is clearly visible, but for the moment it is impossible to tell how they are separated chronologically.

Rockshelters LUV029 and LUV030 at Mouli (Ouvéa Island)

An archaeological survey of southern Ouvéa Island was begun in 1993 in the District of Mouli (Sand and Ouetcho 1993*a*). During the prospecting of the northern part of the Mouli coastal strip, several rockshelters situated in notches of the uplifted coral platform were recorded. It appeared that erosion of the dune on the shoreline threatened these sites and so it seemed desirable to carry out a salvage excavation in 1994 in the two largest shelters.

Shelters LUV029 and LUV030 are situated on the edge of the small plain at Ngahap that forms the northernmost part of the Isle of Mouli at the end of the bridge linking the island with Ouvéa Island and facing the inside of the lagoon

where Fayawa is situated. This plain (LUV028) includes the site of the ancient village of Ngahap and was also used as a horticultural area. Erosion by the sea and the advance of the seafront have progressively covered the areas of cultivation and habitation with layers of sand, which led to the settlement being abandoned about half a century ago. The archaeological layer corresponding to this occupation has been dated on the neighboring site of Kewi, LUV027, to 150 ± 80 B.P. (Beta-62760), cal. A.D. 1670–1950.

Shelter LUV029 is about 15 m wide and 6 m deep with a ceiling just more than a meter above the present surface. The 1 m^2 unit was placed in the middle of the shelter about 2 m from the wall and 3 m behind the shelter entrance. The excavation was carried out in arbitrary 5 cm levels and was continued until a slab of the coral bedrock was reached at 125 cm depth along the southern wall and over 195 cm depth along the northern wall. The stratigraphy was characterized by a succession of ashy, carboniferous, and sandy horizons with pits, often narrow and relatively deep. Seventeen different levels composed of one or several stratigraphic layers were distinguished in the unit.

The stratigraphy of the site can be divided roughly into three parts based on the distribution of archaeological material: (1) a not very pronounced occupation in the top 40 cm, (2) an intense occupation between 40 and 130 cm, and (3) levels in which there is little sign of human presence between 130 cm and the base (Fig. 7). The period of European contact can be recognized by the presence of a fragment of a white clay pipe, an object of exchange during the nineteenth century. The presence of a small fragment of green glass at a depth of 20 cm probably dates from the same interval, as does a small green-blue bead that could

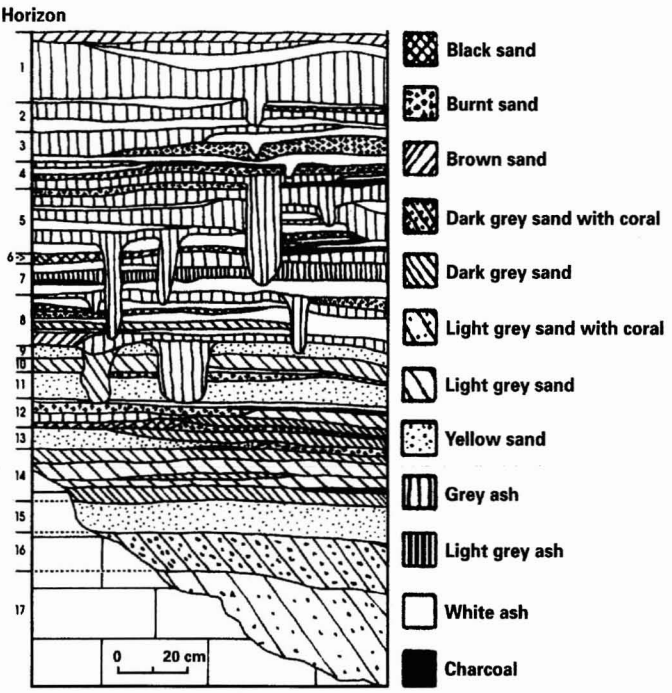

Fig. 7. Stratigraphic profile of Rockshelter LUV029, Mouli, Ouvéa Island.

have come equally well from a necklace or from a missionary rosary. In the levels dating to the period before European contact, a relatively large number of items originating from Grande Terre were found. Pottery sherds, eight in number, are all of the Nera tradition. Their presence demonstrates a preferential link with the south (most probably the southeast) of Grande Terre. The presence of eight flakes of rock crystal of good quality suggests a link with the northeast of Grande Terre. The origin of phthanite fragments of various colors ranging from black to gray to brown is difficult to identify. The presence of waste flakes shows that blade sharpening techniques were in use. The discoveries of a small river pebble and a schist blade having been used perhaps as a cutter complete the collection of objects found that come from outside Ouvéa.

However, the most distinctive objects from the unit are of shell. While the presence of a fragment of a pendant carved in cone shell is unremarkable, the discovery of three fragments of worked pearl oyster are remarkable. Two small disks with a diameter of 2.5 cm, pierced at their centers and with indentations on their exterior faces, were possibly used as ornaments. Another fragment of pearl shell, cut and polished, resembles a part of a fish hook, but it is of small size.

Four sherds with eroded surfaces were found in the lower layers of the unit. According to our interpretation of the stratigraphy, these levels were probably deposited by wave action. The four sherds are light brown in color, finely tempered, and well fired. They may not be of the Nera tradition but rather of the Balabio tradition from northern Grande Terre.

The shell remains discovered in test pit LUV029 have been divided simply into bivalves and gastropods and weighed while waiting for more specific identification. In the two upper levels, which characterize the continuous human occupation of the shelter, bivalves make up a larger proportion than do gastropods. In layers 12 and 14, which mark the intermittent occupation of the shelter, a fluctuation in the shell groups was noted. In the upper part of level 14, the bivalves are more numerous, which is not true of other parts of these levels. In the lower levels, it is the gastropods that are again the most numerous.

Shelter LUV030 faces the sea less than 10 m from the base of the cliff and measures about 10 m long by 4 m deep. Sandy soil is today located less than 120 cm from the summit of the shelter. A unit of 1 m^2 was placed in the central part of the shelter 3 m from the vertical line of the entrance and 2 m from the back of the notch. The excavation exposed 19 stratigraphic levels. Bedrock could not be reached because the sand collapsed frequently, making the excavation both difficult and dangerous. In the northeast portion the test pit reached a depth of 250 cm. Stratigraphic analysis along with the distribution of archaeological material and the shell remains indicate variation in the intensity of occupation of the shelter over time. The first 40 cm appear to represent discontinuous occupation, characterized by many small hearths. Between 40 and 110 cm are levels representing regular, probably continuous occupation with well-marked horizons and numerous shell and bone remains. The lowest 1 m is characterized by short occupations and the regular deposition of sand into the shelter.

The first 20 cm show European presence, with a pierced French coin from the beginning of the twentieth century, as well as a small bronze cross, a blue glass bead, rusty nails, and pieces of glass (of which one is visibly cut), probably dating from the nineteenth century (Fig. 8). The transition between objects of European

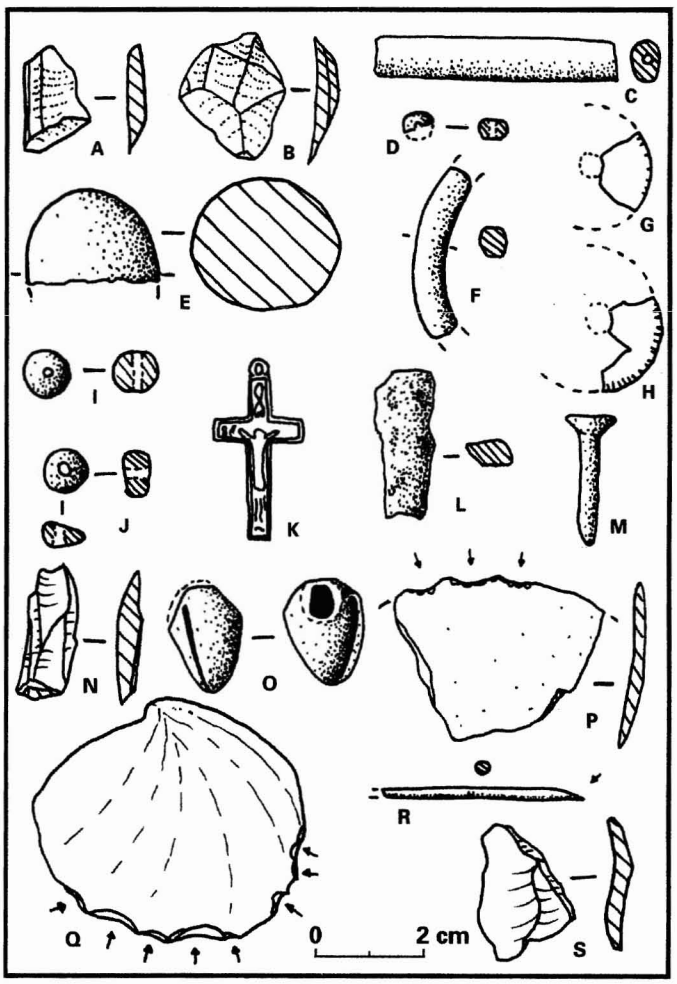

Fig. 8. Artifacts from Rockshelter LUV029 and LUV030, Mouli, Ouvéa Island. A–H (LUV029): A: Rock crystal flake; B: Green bottle-glass fragment (European); C: White clay pipe fragment (European); D: Blue-green glass bead (European); E: Rounded river pebble; F: Conus-shell pendant fragment; G–H: Worked pearl oyster disks. I–S (LUV030): I: Blue glass bead (European); J: Greenstone bead; K: Bronze cross (European); L–M: Iron nails (European); N: Phtanite flake; O: Conidae shell pierced by abrasion; P: Bivalve with indented apex; Q: Bivalve with indented apex (probably used as grater); R: Bird bone with bevelled end; S: Flint-like flake.

origin and non-European objects is located at about 20 cm with the appearance of rock crystal flakes. At the same level there are a small bead of greenstone, probably nephrite, and a slab of schistose rock, possibly coming from northeast Grande Terre. Between 20 cm and about 100 cm, most of the material consists of the remains of worked shells. The presence of bivalves in which the apex is indented, and which could have been used as graters, was noted. Carved fragments of nautilus shell, giant clam, trochus, and several varieties of bivalves were also found in several levels and could represent the remains from cutting. The base of a trochus shell seems to have been worked to extract a bracelet; worked and polished mother-of-pearl fragments seem to be manufacturing stages for fish hooks. A small Conidae shell is pierced by an abrasion on one of its sides and at its apex; it may have been used as an ornament. Between 50 and 55 cm there are several coral abraders.

Interactions with Grande Terre or with other islands of the Loyalty group can be recognized in the lithic and ceramic material, including phthanite flakes and a

flint, particularly around 100 cm. A chip of green rock (serpentine or nephrite) is present at 50 cm and a pebble fragment at 60 cm. There is a paucity of ceramic material; only three sherds have been found. The sherd discovered at 55 cm depth is unquestionably of the Nera tradition. The second sherd discovered at 100 cm depth is not identifiable. Lastly, a sherd from level 14 (140–152 cm) is from a shoulder of an outcurved-rim pot but is not similar to southern New Caledonia tradition. Possibly this pottery belongs to the northern tradition. A final category of archaeological remains is represented by the carbonized remains of pandanus seeds and of coconut endocarps present in levels 10–12 between 80 and 130 cm.

The distribution of bivalves and gastropods indicates that the stratigraphy can be divided into three upper parts, of which two are characterized by a greater preponderance of bivalves, and a lower group (not counting levels 14, 16, and 18) characterized by a greater preponderance of gastropods. The first part, between 0 and 20 cm, includes relatively little shell material and a relative abundance of gastropods. This ensemble corresponds to the post-Contact period. The second part, between 20 and 40 cm, contained about the same proportion of shell material as the first part, but with a slight preponderance of bivalves. The third upper part, between 40 and 52 cm (levels 6 and 7), was richer in shell remains with, again, a slight preponderance of bivalves. From level 8 the proportions present in the shell material changed greatly, with a large increase in gastropods, which represent in levels 8 to 12 an average of twice the weight of the bivalves. In relation to the preceding levels the difference was so striking that it suggests a shift in shellfish abundance nearby.

The location of site LUV029 and its deep stratigraphic column might suggest that the shelter was occupied for a long time. The ceramic material from the excavation indicates an occupation during the second millennium A.D. Carbon samples from level 17 (165–170 cm) and from the base of level 8 (90–95 cm) were submitted for dating. Level 17 has been dated to 890 ± 90 B.P. (Beta-79761), cal. A.D. 990–1290. Level 8, containing the first signs of human activity, has been dated, after C13 correction, to 530 ± 60 B.P. (Beta-77607), cal. A.D. 1305–1465. This date corresponds well with the material analyzed and demonstrates a regular occupation of the shelter during at least the second part of the second millennium A.D., probably in relation with the residential settlement of the Ngahap tribe.

As in the preceding site, the archaeological material discovered in shelter LUV030 suggest occupation within the past 2000 years. Six samples were sent for dating. An initial dating of level 14 gave an unexpected date of 1060 ± 40 B.P. (Beta-77610), cal. A.D. 890–1030. This level was redated after C13 correction to 1760 ± 120 B.P. (Beta-109370), cal. A.D. 15–560, and level 16, below, was redated after C13 correction to 1670 ± 100 B.P. (Beta-109369), cal. A.D. 135–615. The error in the first dating of level 14 is shown by two close datings from level 12 in which the results were 1380 ± 60 B.P. (Beta-77609) cal. A.D. 570–776 and 1400 ± 80 B.P. (Beta-109368) cal. 535 (650) 785 A.D. Level 8 was dated to 1090 ± 90 B.P. (Beta-77606), cal. A.D. 727–1162.

The salvage excavation of the two shelters at the north headland of Mouli, the first to be undertaken on Ouvéa, has provided information on the prehistoric chronology of this part of the Loyalty Islands (Fig. 8). The new data are of geomorphological, cultural, and historical significance.

The stratigraphic study and the datings of different levels have indicated geomorphologic change over the last two millennia. Less than 2000 years ago, the shoreline along northern Mouli was different from what it is today, with the sea much nearer to the present cliff than it is today. It is known that the island of Ouvéa, situated on the Loyalty Islands arc, is being uplifted 0.1 mm per year, on average. The wave cut notches in which the shelters were formed could be related to the Holocene uplift of the coral shelf and may date to this interval. The difference in the basal stratigraphic layers of fine sand in shelter LUV030, and of coral and sand aggregates in shelter LUV029, suggests there was an environmental difference between the two locations. Shelter LUV030, bordered by the lagoon, would have been in a sheltered position facing a dune and a sandy beach that formed at the foot of the cliff oriented more or less east-west. On the other hand, it is likely that the zone facing shelter LUV029 was more coralline and that semi-swampy areas could develop, as can still be seen in the lagoon neighboring Fayawa. The sandy plain of Ngahap did not exist at this time, so occupation by humans was not possible. In the first phase of the zone's occupation, dated to A.D. 1000, the more open and coralline environment of the present coastal plain favored the collection of gastropods. The gradual development of the sandy plain during the first part of the second millennium A.D. allowed human occupation, which can be seen in the renewed occupation of shelter LUV029. This development does not seem to have had repercussions on the zone immediately opposite LUV030. The disappearance of an area for gastropod collection, which was limited during the second millennium A.D. to the lagoon interior to Fayawa and reduced by the progression of the sand dunes, would have led to an evolution in shell-collecting habits and a preponderance of bivalves from this epoch onward.

The regular occupation of the two shelters during the first half of the second millennium led to the rapid accumulation of sediments, as well as to the probable cultivation of certain areas, bringing about the formation of terrigenous sediments that can be observed in present sections of the beach. Shelter LUV030 soon became much too low to be used permanently and a reduction in the number of remains can be seen from 40 cm onward, the semi-desertion of the two sites being linked to the departure of the inhabitants of Ngahap for Fayawa. The erosion of this coastal area, in the immediate past and at present, is the latest episode in a series of regular shoreline fluctuations. The particular configuration that made northern Mouli suitable for human occupation would have existed relatively recently, according to the data obtained from these excavations.

The two test units have produced archaeological material that does not originate on the island of Ouvéa, in particular pottery and stone tools. Pottery of the Nera tradition (south of Grande Terre) is well represented in both sites. However, several sherds discovered in the basal level of both units are not of the Nera tradition. From the observable morphological characteristics, they may be from the Balabio tradition, characteristic of northern Grande Terre in the first millennium A.D. The lithic material is diverse. While the origins of the serpentine adze and the numerous phthanite flakes are unknown, it is likely that the crystal flakes come from northern Grande Terre where they are relatively abundant. The schist blade also likely originates in the north. The greenstone bead and the green rock flake, probably both of nephrite, can for the time being be linked to the nephrite

source on Isle Ouen in southern Grande Terre. Thus interactions with different areas of Grande Terre apparently occurred, whether directly, as in the case of the northeast, or through Lifou and Maré as intermediaries. It appears, especially from the ceramic material, that a shift in interaction occurred between the end of the first millenium, when sherds can be linked to northern Grand Terre, and the beginning of the second millennium, with sherds coming from southern Grand Terre.

During the study of the material excavated from the two sites, a large amount of worked shell was observed. It appears that shell was worked to make scrapers, to obtain cutting edges, to obtain objects for decorative purposes, and to produce fishing tools. The scrapers and cutters may be connected with kitchen uses, such as the peeling of tubers. The presence of mother-of-pearl ornaments also has been established for this excavation.

In the two units, artifacts occur that are linked to European contact in the nineteenth and the beginning of the twentieth centuries. These objects bear witness to the period of contact, first with sailors (as shown by the glass bead and the clay pipe fragment), then with missionaries (through the presence of the bronze cross). They cover the junction between the prehistoric and historic periods on the island of Ouvéa. Cheyne, when visiting Ouvéa in 1842, wrote, "... the jewelry worn by this people is made of jade beads, attached with a thick cord made from vampire fur.... Since they have entered into relations with us glass beads have become their principal adornment. Large blue beads are the most highly esteemed" (Pisier 1975 : 66). The various objects mentioned in this excerpt have all been found in the course of the Mouli excavations.

DISCUSSION

The various excavations described here make it possible to situate the prehistoric chronology of the Loyalty Islands in a broader context, covering 3000 years of human history. The excavations of 1994–1995 have identified, in four of the sites studied, an early occupation linked to the arrival of Austronesian populations. The discovery of Lapita pottery at two of the Lifou sites is the first evidence of the existence of this ceramic tradition on the largest of the Loyalty Islands (although Lapita pottery has now been discovered at a site on the southeast coast). The presence in the deepest layer of site LWT008 at Hnajoisisi of sherds decorated with dots, solid impressions, and shell impressions demonstrates the existence of several varieties of decoration from the beginning of settlement here. This variety of pottery also appears at site LWT054 at Keny, where the same associations of decoration can be found. One of the decorations to be noted is the solid decoration made with the same type of tools as the dentate-stamped decoration. This type of decoration has been little-reported at Lapita sites on Grande Terre (Sand 1996*c*). These characteristics suggest the existence of a Lapita tradition specific to the Loyalty Islands. Whether this is due to local fabrication of Lapita tradition pots, with some imported materials including in particular an ultrabasic temper, or if the pots were for the most part imported from a particular region of Grande Terre where these decorative traditions had developed is at present unknown. The presence of a single sherd at site LWT054 at

Keny, which was decorated by dotting with large teeth and is similar to decoration from the Fiji–western Polynesia region, cannot be resolved here. Presumably, the origins of the vessels may vary according to location and time periods.

The second significant finding from these excavations is the strong representation of Podtanean pots. Until recently, only a few sherds have been identified in surface collections and during the excavation of site LMA020 at Patho (Sémah and Galipaud 1992). The relative abundance of paddle-impressed sherds in three of the four shelters shows that this ceramic tradition is most easily recognized as the major archaeological marker of the Koné period in the Loyalty Islands. Levels containing Lapita pottery are restricted to the beginning of the chronology and do not appear in more recent sites. This raises the question of the relation between the two ceramic traditions (Sand 1995*a*, 1998*a*), and does not seem to confirm the hypothesis sometimes advanced (Galipaud 1992) of a more recent introduction of the Lapita tradition into New Caledonia, after the appearance of the Podtanean tradition. It should also be noted that the sites holding the largest proportion of paddle-impressed sherds are located on the west coasts, opposite Grande Terre, while in the eastern sites at Keny on Lifou and at Patho on Maré, far less material of this tradition has been found. The end of the period associated with Podtanean pottery is as yet unknown but appears to be after the beginning of the first millennium A.D. If so, it would extend the interval beyond the period known at present for Grande Terre, particularly in the south. The identification of the geographic origin of the paddle-impressed pots should make it possible to ascertain the links in interaction with Grande Terre. In this context it is useful to note the persistence of coral sand temper in Koné period pots. The abrupt cessation sometimes envisaged (Galipaud 1990) of this type of temper is not a uniform occurrence in the New Caledonian sequence.

Variable abundance of stone flakes at these sites shows that this category of objects was also regularly imported. The large number of flakes present in level E at site LWT008 at Hnajoisisi, which clearly came from the same adze, suggest that these objects may have been reworked because of their rarity. This observation may also apply to flakes of phthanite, flint, and quartz, all of which are, on average, of a smaller size than flakes from sites on Grande Terre. The most unexpected discovery is certainly the presence of two small fragments of nickel ore in site LTA037 at Hnenigec. The presence of this ore, characteristic of Grand Terre but quite unusable in its original state, is a sign that it was transported to the Loyalty Islands even though it had no utilitarian value.

The discovery of six finished fish hooks and of several in the stages of manufacture is one of the major finds of these excavations. It is now possible to situate this artifact class within the New Caledonian chronology, which has not been the case heretofore. The simple typological form of the fish hooks discovered, their small size, and the absence, for the moment, of lures, suggests that they were used to catch small and medium-sized fish (Leach et al. 1998). Shell beads discovered in site LWT008 at Hnajoisisi and in site LTA042 at Peete are the first to be reported in archaeological excavations in the Loyalty Islands. In both sites they are associated with paddle-impressed sherds. The beads have been made out of a variety of shells. The typological form of these objects is similar to the beads used as trade materials in traditional Kanak society. The presence of ornaments suggests that, from the first settlement of the Loyalty Islands, groups specialized in

the fabrication of beads, and these beads may have been used as exchange with groups from Grande Terre. This hypothesis cannot be clearly substantiated without a comparison of the sites of the two areas. On the other hand, the presence in site LUV030 of a greenstone bead can perhaps be tied to the exchanges, known from the ethnographical period, between Grande Terre and the Loyalty Islands called the "jade cycle" (Leenhardt 1937). A similar bead of greater diameter has been found at the other end of the archipelago on the dune LMA020 at Patho on Maré (Sand 1994). The discovery on Ouvéa thus confirms a wider distribution for this type of object.

The last class of material that is now better understood is that of ornaments. While cone shell bracelets were already known from other sites, some of them include particular typological forms, for example, the object found in excavation D at site LWT054 at Keny. But it is the discovery of pearl shell ornaments at site LUV029 on Ouvéa that is the most interesting. This form of slightly toothed disk has not been found in New Caledonia. It is, however, similar to objects known from early archaeological levels in eastern Polynesia (Bellwood 1979: fig. 11.18). There are no objects fabricated from the giant clam shell (*Tridacna* sp.): these objects are a characteristic feature of sites dated to the Koné period on Grande Terre.

A variety of materials are documented here that originated on Grand Terre; these include pottery, adze flakes, worked stone flakes, and exogenous stones. The Loyalty Islands archipelago was not isolated during the prehistoric period, confirming what has been known from oral history. In addition, the excavations show variation in the volume of transport during this period. Variation in the quantity of sherds of the Podtanean tradition between sites located on the west and east coasts, respectively, of Lifou and Maré, has already been posed. There also appears to have been a clear reduction in the amount of imported material on both islands during the most recent portion of the chronology. No sherds of Plum pottery have been found and only a few sherds of Nera pottery are present. The same is true of lithic material.

There are several possible reasons for this shift. First, the evolution of sociocultural behavior during the first millennium A.D., partly linked to demographic increase (Sand 1995*a*), would have led to a redefinition of interaction networks and their utility. This may have slowed down exchanges, with each group becoming more isolated. Second, sociocultural evolution may have brought about a new form of occupation of the islands' landscape, in which the shelters would have undergone a change in function. This would account for the paucity of material present in the upper levels of the Hnajoisisi and Hnenigec shelters. The Mouli shelters, situated in the immediate proximity of the newly created habitat of Ngahap, in a small space, would not have been affected by this evolution. Third, the arrival in the Loyalty Islands of new groups originating elsewhere in the archipelago or from neighboring archipelagos (Vanuatu, Fiji, western Polynesia) led to changes in alliances. These would also have evolved toward geographically nearer relations, Maré serving as the point of entry to southern Grande Terre, and Ouvéa for the north. The difference in orientation of interaction seems relatively clear among the recent archaeological material compared with the Koné period. Last, it is possible that the evolution of interaction is apparent only in archaeological remains and that in fact changes are due to a difference in the products exchanged, with the transport of vegetable products that

are not conserved in the soil (wood for construction of canoes, mats, tapa, and so forth).

The presence in most of the sites of material connected with the first period of contact with European ships makes it possible to recognize the passage from prehistory to contemporary history. The limited number of objects discovered is offset by their variety. The presence of ordinary everyday objects may be noted, such as fragments of glass bottles often bearing a patina of use and time. Some have clear marks of sharpening, demonstrating their use as cutting tools. The second category of remains includes articles of barter such as glass beads and clay pipes. These types of provisions were carried by all ships sailing in the waters of the western Pacific from the end of the eighteenth century onward. Lastly, among metallic objects found, the presence in site LUV030 of a small bronze cross points to the transition to another epoch marked in the Loyalty Islands by the drop in population caused by new infectious diseases (Sand in press), and by religious wars and the subsequent abandonment of traditional settlements and the relocation of groups around religious missions. The contemporary spatial organization in the different islands is clearly the result of this latest phase of cultural evolution.

Archaeologists working in southern Melanesia have long envisaged an early preceramic peopling of New Caledonia and Vanuatu. The existence on Lifou and Maré of oral traditions in which the first inhabitants are described as a nonhorticultural people, feeding themselves with the roots of wild plants and living in caves, may be a sign of a prehorticultural period in the Loyalty Islands, unless it is, in fact, a metaphoric account without historical reality. The archaeological excavations in rockshelters on Lifou, Maré, and Ouvéa have provided the opportunity to search for the presence, as in northern Melanesia (Allen and Gosden 1991), of preceramic remains in archaeological deposits. The results show no traces of human occupation that predate the appearance of pottery. This is also the case in site LWT054 at Keny. As far as is known at present, the beginning of human occupation of the Loyalty Islands was characterized by Austronesian populations using pots of the Lapita and Podtanean traditions. The dates obtained on the two earliest Lifou sites indicate that this occupation began at least by 900–800 B.C., which is just a little later than for Grande Terre (Sand 1997). It seems reasonable to suggest that future dates from other sites may push back the timing of the first occupation (see Note 2).

These excavations have shown that this first period of occupation did not lead to the general installation of an established population. In fact, shelters that are less suitable for occupation for reasons of their shape or of their position were not occupied until much later in the course of the first millennium B.C., probably at the same time as the first occupation of the islands' plateaus. These sites are associated with Podtanean tradition pots. The excavations in the two shelters on Ouvéa show that the occupation of certain sites was also a function of natural factors affecting the coast in these islands. Geomorphological changes have possibly destroyed some of the early sites so that understanding of the variety of sites occupied during prehistory may be incomplete.

All of the rockshelter sites containing a relatively long stratigraphy indicate a change in their use during the first millennium A.D. It was during this period that fortifications, an indirect sign of tensions between groups, appeared on the island

of Maré (Sand 1996*b*). In spite of the continuation of exchange relations with Grande Terre, the amount of imported material was considerably reduced in the sites excavated, mainly on Lifou and Maré.

The results obtained from excavations in the Loyalty Islands make it possible to amplify several issues in the regional prehistory of Melanesia. First is the absence of preceramic occupation in the excavated sites and the presence of Lapita sherds in the earliest layers of these sites. The dates obtained support the hypothesis of a rapid advance of colonization toward southern Melanesia about 1100–1000 B.C. (Sand 1997).

The importance of transporting materials in the first millennium of human occupation is an indication of interaction networks between Grande Terre and the Loyalty Islands. This is similar to that observed during other periods of colonization, for example in central Polynesia (Walter 1989). One of the most interesting aspects of these excavations has been the evidence that relations with Grand Terre have been principally with the east coast and the north. The absence of sherds with incised decoration of the Puen tradition, typologically close to Mangaasi of northeast Vanuatu (Sand 1998*a*), suggests that from the first centuries of human occupation two cultural entities were differentiated in New Caledonia.

A reduction in exchange, as has been described here, and in the navigation network after a period of colonization, has been recognized in other regions of the Pacific, including western Polynesia (for example, Kirch 1988), the Cook Islands (Walter 1989; Kirch et al. 1992), and the Marquesas Islands (Rolett 1997). It may explain the apparent cessation of permanent occupation on Walpole during the first millennium A.D. (Sand 1995*b*) and its subsequent intermittent use as a relay point toward Grande Terre and the Isle of Pines; Weisler (1994) makes a similar case for Henderson Island. The reduction in the flow of exchange during the first millennium A.D. has not been recognized elsewhere in Melanesia.

The reconstruction of the most recent chronological phase is aided by data from oral traditions. The New Caledonian interaction network that was best known in the period of contact is referred to as "the jade cycle." This interaction network linked the various islands of the Loyalties to Grande Terre and the Isle of Pines by cycles of ritual exchanges that had at their center a special ceremonial axe (*hache ostensoir*) made of jade. The discovery on the site at Patho on Maré of a small axe of this type, probably originating on the Isle of Ouen and dated to calibrated A.D. 890–1200, shows that the first appearance of the network between the southern end of the archipelago and Maré is more than 1000 years old (Sand 1995*a*). The establishment of a specifically Kanak tradition (Sand 1998*b*) is an indication of the perpetuation of cultural characteristics that can be connected with societies described by European seafarers for the first time.

Oral traditions also speak of the arrival of nonlocal groups of people to the Loyalty Islands (Guiart 1992; Sand 1995*a*). While the arrivals of groups from Grande Terre are difficult to date, the more recent establishment of groups originating in southern Vanuatu (Xetriwaan network) or in western Polynesia (Wallis, Samoa, Tonga) is restricted to the last few centuries before the arrival of Cook. The Xetriwaan network, probably related indirectly to the Tongan maritime empire, led to the recombination of some political entities in the Loyalty Islands. The arrival of a group from Wallis Island at the end of the eighteenth century on Ouvéa, probably following arrivals by other Polynesians, helped to

establish a Polynesian language (Faga Uvea) in the middle of a Melanesian language area.

Polynesian influences during the last millennium are known throughout southern Melanesia (for example, Kirch and Yen 1982; Spriggs 1997). The earliest European accounts report the presence of small groups of Polynesians in several regions of the New Caledonian archipelago, in several coastal locations. Today, even the recollection of these occupations has disappeared from most of the Grande Terre traditions. But the account of D'Entrecasteaux at Balade (northeast coast of Grande Terre) in 1793 described the arrival of a canoe "from Avouea," in all likelihood from the Island of Wallis in western Polynesia (Guiart 1994 : 115), and is direct evidence of the intermittent presence of canoes from the east at the end of the eighteenth century in New Caledonia. Even though archaeological material provides evidence of a reduction in interaction networks during the more recent portion of the prehistoric chronology, oral traditions suggest the persistence of the Loyalty Islands into a larger (but less intensive) interaction network encompassing the southwest Pacific from Vanuatu to western Polynesia.

The results of the excavations conducted so far show that human chronology in the three islands has been complex, marked by variation in evidence of interaction, and by transformations in the occupation of space. Certainly, pre-European history in the Loyalty Islands has never been immutable. Nonetheless, these developments need to be better understood through intensive study of the recovered archaeological material, through the continuation of the excavation programs, and through a reappraisal of the analysis of cultural evolution of Oceanic societies in southern Melanesia.

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NOTE

1. All dates are presented with C13 correction when available and have been cal. B.C./A.D. at two standard deviations using the Calib 3 program (Stuiver and Becker 1993).
2. Dates recently obtained from the Lapita site LMA023 of Kurin (Maré) have given reliable results of 1045 cal B.C. for the first occupation layer (Sand et al. 1998).
3. The fish bone analysis of the Loyalty Islands sites has recently been completed (Leach et al. 1998).

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ABSTRACT

Recent archaeological research in the Loyalty Islands of New Caledonia has added to our understanding of the region's culture history. Excavations at nine primarily rockshelter sites on the islands of Ouvéa, Lifou, and Maré suggest that the earliest human occupation of the Loyalty Islands, as with New Caledonia, is attributed to the Lapita complex; there is no preceramic tradition evident at these sites. Along with dentate-stamped pottery, the Lapita age ceramics are associated with other forms of decoration that have not been described previously. The Lapita assemblage and assemblages from subsequent occupations at these sites produced pottery and lithic materials suggestive of continuous but diminishing interaction over time with the main island of New Caledonia. Several sites contain archaeological deposits that record the transition to recent history and the arrival of European voyagers and missionaries in the region. KEYWORDS: Loyalty Islands, New Caledonia, Lapita, culture history, Melanesian archaeology.